

Exhibit 8

**UTILITY
PATENT APPLICATION
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

042106.0003

First Inventor

Dong Ryeol SHIN et al.

Title

MOBILE TERMINAL-BASED VIRTUAL GAME ...

Express Mail Label No.

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. **Fee Transmittal Form.**
(PTO/SB/17 or equivalent)
2. **Applicant claims small entity status.**
See 37 CFR 1.27.
3. **Specification.** [Total Pages 33]
Both the claims and abstract must start on a new page.
(For information on the preferred arrangement, see MPEP § 608.01(a))
4. **Drawing(s).** (35 U.S.C. 113) [Total Sheets 3]
5. **Inventor's Oath or Declaration.** [Total Sheets]
(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))
 - a. Newly executed (original or copy)
 - b. A copy from a prior application (37 CFR 1.63(d))
6. **Application Data Sheet.** *See Note below.
See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
7. **CD-ROM or CD-R.**
in duplicate, large table or Computer Program (Appendix)
 Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission.**
(if applicable, items a. – c. are required)
 - a. Computer Readable Form (CRF)
 - b. Specification Sequence Listing on:
 - i. CD-ROM or CD-R (2 copies); or
 - ii. Paper
 - c. Statements verifying identity of above copies

ADDRESS TO: **Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450**

ACCOMPANYING APPLICATION PARTS

9. **Assignment Papers.**
(cover sheet & document(s))
Name of Assignee _____
10. **37 CFR 3.73(c) Statement.** **Power of Attorney.**
(when there is an assignee)
11. **English Translation Document.**
(if applicable)
12. **Information Disclosure Statement.**
(PTO/SB/08 or PTO-1449)
 Copies of citations attached
13. **Preliminary Amendment.**
14. **Return Receipt Postcard.**
(MPEP § 503) (Should be specifically itemized)
15. **Certified Copy of Priority Document(s).**
(if foreign priority is claimed)
16. **Nonpublication Request.**
Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. **Other:** _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

18. CORRESPONDENCE ADDRESS

<input checked="" type="checkbox"/>	The address associated with Customer Number:	89980	OR <input type="checkbox"/>	Correspondence address below
Name				
Address				
City		State		Zip Code
Country		Telephone		Email
Signature	/S. Laura Chung/		Date	June 21, 2013
Name (Print/Type)	S. Laura Chung		Registration No. (Attorney/Agent)	59875

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
		Application Number	
Title of Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

Secrecy Order 37 CFR 5.2

Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to
 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Dong Ryeol		SHIN		
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Gunpo-si	Country of Residence i			KR

Mailing Address of Inventor:

Address 1	106-1101, Mugunghwa Jugong Apt., Geumjeong-dong,			
Address 2	Gyeonggi-do			
City	Gunpo-si	State/Province		
Postal Code	435-050	Country i	KR	

Inventor 2					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Choon Sung		NAM		
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Seoul	Country of Residence i			KR

Mailing Address of Inventor:

Address 1	105-1603, Yeongdeungpo Prugio, Yeongdeungpo-dong			
Address 2	Yeongdeungpo-gu			
City	Seoul	State/Province		
Postal Code	150-797	Country i	KR	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.				
<input type="button" value="Add"/>				

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
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Title of Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

An Address is being provided for the correspondence information of this application.

Customer Number	89980
Email Address	info@nsiplaw.com

Application Information:

Title of the Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		
Attorney Docket Number	042106.0003	Small Entity Status Claimed	<input checked="" type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)	

Publication Information:

Request Early Publication (Fee required at time of Request 37 CFR 1.219)

Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	89980		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status		<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
		Application Number	
Title of Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

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Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
10-2012-0067288	KR	2012-06-22	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

Authorization to Permit Access:

Authorization to Permit Access to the Instant Application by the Participating Offices

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
		Application Number	
Title of Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1		<input type="button" value="Remove"/>
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.		
<input type="button" value="Clear"/>		
<input checked="" type="radio"/> Assignee	<input type="radio"/> Legal Representative under 35 U.S.C. 117	<input type="radio"/> Joint Inventor
<input type="radio"/> Person to whom the inventor is obligated to assign.	<input type="radio"/> Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :			
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	RESEARCH & BUSINESS FOUNDATION SUNGKYUN UNIVERSITY		
Mailing Address Information:			
Address 1	Sungkyunkwan University, 300, Cheoncheon-dong,		
Address 2	Jangan-gu, Gyeonggi-do		
City	Suwon-si	State/Province	
Country	KR	Postal Code	440-746
Phone Number	Fax Number		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
		Application Number	
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Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Non-Applicant Assignee Information:

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Assignee 1				
Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).				
Remove				
If the Assignee is an Organization check here. <input type="checkbox"/>				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information:				
Address 1				
Address 2				
City			State/Province	
Country			Postal Code	
Phone Number			Fax Number	
Email Address				
Additional Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications				
Signature	/S. Laura Chung/		Date (YYYY-MM-DD)	2013-06-21
First Name	S. Laura	Last Name	Chung	Registration Number
Additional Signature may be generated within this form by selecting the Add button. Add				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	042106.0003
		Application Number	
Title of Invention	MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE CONTROL SYSTEM USING THE SAME		

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

MOBILE TERMINAL-BASED VIRTUAL GAME CONTROLLER AND REMOTE
CONTROL SYSTEM USING THE SAME

BACKGROUND OF THE INVENTION

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1. Field of the Invention

The present invention relates generally to a user controller and, more particularly, to a mobile terminal-based remote control system.

10

2. Description of the Related Art

Most games running on personal computers and game consoles are chiefly played in such a manner that a gamer manipulates the movement of principal characters or principal objects or interactions with a game environment. This manipulation may be performed using a proprietary controller such as a proprietary joystick or a joypad in the case of a game console, or a general-purpose user controller such as a mouse or a keyboard in the case of a personal computer.

20 There is a contradiction in the playing of games in various genres and forms on a specific game console using a proprietary controller. That is, a single common controller becomes expensive and complicated if it is used to deal with various game manipulation rules, and game manipulation rules 25 should be simplified if a controller is constructed in a

simple form.

Meanwhile, when a general-purpose user controller such as a mouse or a keyboard is used, the inherited limitations and disadvantages of the mouse or keyboard are maintained because 5 they are not manufactured only for games. For example, although a mouse is easy to manipulate, the number of buttons thereof is limited and the combinations of buttons are limited. In contrast, although a keyboard can deal with various game manipulation rules, but may be clumsy because of 10 so many keys and so large the size of the keyboard.

As a result, if the interface of a controller can be optimized for each one of games having various manipulation methods, a single controller can be applied to various games.

15

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a mobile 20 terminal-based virtual controller capable of manipulating an application running on a remote computer, and a remote control system using the same.

According to an aspect of the present invention, there is provided a virtual controller client, the virtual controller 25 client operating based on a mobile terminal so that the

virtual controller client can remotely communicate with a virtual controller server running on a computer for remote key input on an application running on the computer, the virtual controller client including:

5 a button setting adjusting unit configured to receive button setting information including mapping relationship between key inputs to the application and virtual input messages from the virtual controller server, and to specify an arrangement and attributes of virtual buttons based on the
10 received button setting information;

a user virtual button interface configured to generate a virtual button screen in which touch regions corresponding to the virtual buttons are visually displayed, and to display the virtual button screen on a touch screen of the mobile
15 terminal;

a touch event filter configured to generate touch input messages that can be recognized as key inputs by the application, based on touch event objects that are generated based on touch signals for regions corresponding to the
20 virtual buttons, which belong to touch signals input via the touch screen; and

a client message interfacing unit configured to convert the touch input message into a virtual input message in a form that can be received by the virtual controller server, and to
25 output the virtual input message.

The user virtual button interface may activate an acceleration sensor of the mobile terminal so that movements of the mobile terminal can be detected;

the virtual controller client may further include an acceleration data filter configured to generate a movement input message that can be recognized as a key input by the application, based on acceleration data that is generated based on an acceleration signal generated by the acceleration sensor; and

10 the client message interfacing unit may operate such that the client message interfacing unit converts the touch input message or movement input message into a virtual input message in a form that can be received by the virtual controller server and outputs the virtual input message.

15 According to another aspect of the present invention, there is provided a virtual controller server, the virtual controller server operating on a computer so that the virtual controller server can remotely communicate with a virtual controller client running on a remote mobile terminal 20 including a touch screen for remoter key input on an application running on the computer, the virtual controller server including:

a button setting generating unit configured to generate button setting information including mapping relationship 25 between key inputs to the application and virtual input

messages;

5 a server message interfacing unit configured to transmit a setting message including the button setting information to the virtual controller client, and to receive a virtual input message generated based on a touch on the touch screen from the virtual controller client; and

a key mapping unit configured to identify a key input value mapped to the received virtual input message based on the button setting information.

10 The mobile terminal may further include an acceleration sensor configured to detect movements, and the server message interfacing unit may operate such that it receives a virtual input message generated based on a movement of the mobile terminal.

15 The key mapping unit may transfer a key input value to the application via the message transfer architecture of an operating system that runs the application on the computer.

20 The key mapping unit may transfer a key input value to the application via the input and output application programming interface (API) of an operating system that runs the application on the computer.

According to another aspect of the present invention, there is provided a remote control system, including:

25 a virtual controller server configured to run on a computer such that it generates button setting information

including mapping relationship between key inputs to an application running on the computer and virtual input messages, transfers the button setting information to a virtual controller client, extracts a key input from a virtual 5 input message received from the virtual controller client, and provides the key input to the application; and

a virtual controller client configured to remotely communicate with the computer, configured to run on a mobile terminal including a touch screen, and configured to specify 10 an arrangement and attributes of virtual buttons based on the button setting information received from the virtual controller server, to generate a virtual button screen in which touch regions corresponding to the virtual buttons are visually displayed on the touch screen of the mobile terminal, 15 to generate a touch input message that can be recognized as a key input by the application, based on touch event objects generated based on touch signals for regions corresponding to the virtual buttons, which belong to touch signals input via the touch screen, and to convert the touch input message into 20 a virtual input message in a form that can be recognized by the virtual controller server and output the virtual input message.

The mobile terminal may further include an acceleration sensor configured to detect movements; and
25 the virtual controller client may operate such that it

activates an acceleration sensor of the mobile terminal so that movements corresponding to the virtual buttons can be detected, generates a movement input message that can be recognized as a key input by the application, based on 5 acceleration data that is generated based on an acceleration signal generated by the acceleration sensor, and converts the touch input message or movement input message into a virtual input message in a form that can be received by the virtual controller server and then outputs the virtual input message.

10 According to still another aspect of the present invention, there is provided a remote controller interfacing method, the remote controller interfacing method using a virtual controller server running on a computer and a virtual controller client running based on a remote mobile terminal 15 including a touch screen in order to perform key input on an application running on the computer, the remote controller interfacing method including:

generating, by the virtual controller server, button setting information including mapping relationship between key 20 inputs required by the application and virtual input messages to be transmitted by the virtual controller client, and transferring, by the virtual controller server, the button setting information to the virtual controller client;

specifying, by the virtual controller client, an 25 arrangement and attributes of virtual buttons based on the

button setting information, and displaying, by the virtual controller client, a virtual button screen in which virtual button regions are visually arranged on the touch screen;

5 generating, by the virtual controller client, touch event objects based on a touch signal generated by the touch screen, and generating, by the virtual controller client, a touch input message based on the valid touch event objects;

outputting, by the virtual controller client, a virtual input message generated based on the touch input message;

10 identifying, by the virtual controller server, a key input value mapped to the received virtual input message based on the button setting information; and

transferring, by the virtual controller server, the identified key input value to the application.

15 The mobile terminal may further include an acceleration sensor configured to detect movements; and

the remote controller interfacing method may further include:

20 generating, by the virtual controller client, a movement input message that can be recognized as a key input by the application, based on acceleration data that is generated based on an acceleration signal generated by the acceleration sensor; and

25 converting, by the virtual controller client, the movement input message into a virtual input message in a form

that can be received by the virtual controller server, and outputting, by the virtual controller client, the virtual input message.

The key input value identified by the virtual controller server may be transferred to the application via the message transfer architecture of an operating system that runs the application on the computer.

The key input value identified by the virtual controller server may be transferred to the application via the input and output API of an operating system that runs the application on the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a conceptual diagram illustrating a virtual controller client implemented in a mobile terminal and a virtual controller server implemented in a personal computer according to an embodiment of the present invention;

FIG. 2 is a conceptual diagram illustrating an example of the screen of a mobile terminal when a virtual controller is implemented on the mobile terminal according to an embodiment

of the present invention; and

FIG. 3 is a flowchart illustrating a remote controller interfacing method using a virtual controller client implemented on a mobile terminal and a virtual controller server implemented on a personal computer according to an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Specific structural and functional descriptions of embodiments of the present invention will be given merely for the illustration of the present invention. Therefore, embodiments of the present invention may be embodied in various forms, and should not be interpreted as being limited 15 to the embodiments that will be described below.

The embodiments of the present invention will be described in detail below with reference to the accompanying drawings. Like reference numerals will be assigned to like elements throughout the accompanying drawings, and redundant 20 descriptions of the like elements will be omitted.

FIG. 1 is a conceptual diagram illustrating a virtual controller client 20 implemented in a mobile terminal 200 and a virtual controller server 10 implemented in a personal computer 100 according to an embodiment of the present 25 invention.

Referring to FIG. 1, the virtual controller server 10 is executed as a background task in the personal computer 100, on which a game application 30 to be controlled is running, and the virtual controller client 20 is executed as a foreground task in the mobile terminal 200.

The personal computer 100 may be schematically viewed as including a wired/wireless communication interface 101, an application layer 102, a subsystem layer 103, and a kernel mode 104. In this case, the game application 30 and the 10 virtual controller server 10 may be viewed as running in the application layer 102 and the subsystem layer 103, respectively.

Although the game application 30 is referred to for the sake of illustration, the present invention is not limited to 15 game applications, but may be applied to any types of applications that require users to remotely control functions and operations of the applications somewhat apart from screens.

The virtual controller server 10 generates button setting 20 information including mapping relationship between key inputs, required by the game application 30, for example, directional key inputs related to the movement of a game character, direction key inputs related to the gaze direction of a game character, operation key inputs related to the actions of a 25 game character, and function key inputs related to the playing

of a game, and virtual input messages to be transmitted from the virtual controller client 20. It also transfers a setting message encapsulating the button setting information to the virtual controller client 20 of the mobile terminal 200, 5 extracts a key input intended by a gamer from a virtual input message received from the virtual controller client 20, and provides information about the key input to the game application 30.

For these purposes, the virtual controller server 10 may 10 include a button setting generating unit 11, a server message interfacing unit 12, a key mapping unit 13, and a message converting unit 14. The virtual controller server 10 may use a legacy input/output processing unit 15 for the input and output of a keyboard and a mouse in the kernel mode 104, and a 15 Direct Input application programming interface (API) 16 in the application layer 102.

The mobile terminal 200 may include a wired/wireless communication interface 201, a touch screen 202 configured to display a virtual button screen to a user and to generate a 20 touch signal based on a location touched by a user, an acceleration sensor 203 configured to generate an acceleration signal in response to the tilt or movement of the mobile terminal 200 in a 3 dimensional space, and a mobile OS platform 204 on which the virtual controller client 2 runs.

25 The virtual controller client 20 runs on the mobile OS

platform 204, and may extract the button setting information from the setting message transferred from the virtual controller server 10 of the personal computer 100 via the wired/wireless communication interface 201, generate a virtual 5 button screen according to the extracted button setting information, and display the virtual button screen on the touch screen 202.

Thereafter, the virtual controller client 20 generates a virtual input message for the game application 30 in an 10 integrated manner, based on a touch input message, generated by the touch screen 202 that identifies a location where a user has performed a touch operation on a displayed virtual button screen, and a movement input message, generated by the acceleration sensor 203 that detects movement when a user 15 moves the mobile terminal 200.

For this purpose, the virtual controller client 20 may include a button setting adjusting unit 21, a user virtual button interface 22, a touch event generating unit 23, a touch event filter 24, an acceleration data generating unit 25, an 20 acceleration data filter 26, and a client message interfacing unit 27.

In an embodiment, more than one single virtual controller client 20 may be connected to a single virtual controller server 10. In this case, the virtual controller server 10 may 25 bind virtual input messages input from a plurality of virtual

controller clients 20 and then provide the virtual input messages to the application 30.

In such an embodiment, for example, a plurality of gamers may control a plurality of game characters at the same time 5 within a single game, and a plurality of mobile terminals 200 may generate a large virtual button screen as a whole by causing the plurality of mobile terminals 200 to display respective portions of a single virtual button screen.

10 The operations of the virtual controller server 10 and the virtual controller client 20 will be sequentially described below.

First, a gamer runs the virtual controller server 10 and the application 30 on the personal computer 100, then runs the virtual controller client 20 on the mobile terminal 200, and 15 manipulates the personal computer 100 and the mobile terminal 200 to recognize each other on a single wired/wireless network via the wired/wireless communication interfaces 101 and 201.

The wired/wireless communication interfaces 101 and 201 may appropriately use a serial wired interface based on an 20 open or proprietary standard or well-known or commonly-used short-distance bi-directional wireless communication technologies, such as IrDA, Bluetooth, WiFi, WiFi Direct, or 2.4 GHz band RF interfacing technology.

In order to enable the mobile terminal 200 to display a 25 virtual button screen optimized for the performance of a game

of the game application 30, the button setting generating unit 11 of the virtual controller server 10 generates button setting information including mapping relationship between key inputs required by the application 30 and virtual input 5 messages to be transmitted by the virtual controller client 20.

The button setting information is information indicating which key input should be mapped to a specific virtual input message when the virtual controller client 20 returns the 10 specific virtual input message to the virtual controller server 10.

In other words, a button setting information is a kind of information that indicates which form of virtual input message should be provided from the virtual controller client 20 for a 15 specific key input value to the game application 30.

For example, if the application 30 is set such that it recognizes the "s" key of a keyboard as a character forward movement key, the button setting information may be generated such that the "s" key of the keyboard is mapped to a virtual 20 input message based on a touch input message that is generated by touching the forward movement button region of the virtual button screen. In another example, if the application 30 is set such that it recognizes the movement of a mouse as a character gaze direction key, the button setting information 25 may be generated such that a mouse movement key is mapped to a

virtual input message based on a movement input message that is generated by tilting the mobile terminal 200.

This button setting information may be previously generated by a game producer, or may be generated in 5 accordance with the intention of a gamer.

Furthermore, the button setting information may be dynamically changed while playing a game. For example, to make a progress in a game, sometimes a character needs to move in a field and in another time a character needs to grow up.

10 Those cases may require different game interfaces. In these cases, the virtual controller server 10 may dynamically change the button setting information in accordance with a game environment and apply on-the-fly the changed button setting information to the virtual controller client 20.

15 The button setting generating unit 11 transfers the button setting information to the server message interfacing unit 12, and the server message interfacing unit 12 in turn transmits the button setting information to the mobile terminal 200 via the wired/wireless communication interface 201. 20

The button setting information received via the wired/wireless communication interface 201 of the mobile terminal 200 is transferred to the button setting adjusting unit 21.

25 The button setting adjusting unit 21 may generate the

virtual button setting information by specifying the arrangement and attributes of virtual buttons that will generate virtual input messages that should be provided to the virtual controller server 10 by the virtual controller client 5 20 based on the button setting information. The button setting adjusting unit 21 may specify the arrangement or attributes of buttons as previously predetermined or in accordance with the intention of a gamer.

For example, the button setting adjusting unit 21 may 10 generate the virtual button setting information so that a relatively wide touch region on the left side of a virtual button screen is mapped to four direction keys related to the movement of a game character, a plurality of relatively small touch regions on the right side of the virtual button screen 15 are mapped to an operation key related to the operation of the game character and function keys related to the playing of a game, and the direction of movement of the mobile terminal 200 is mapped to a game character gaze direction key.

The user virtual button interface 22 generates a virtual 20 button screen on which touch regions corresponding to virtual buttons are visually displayed in accordance with the virtual button setting information, displays the virtual button screen on the touch screen 202, and activates the acceleration sensor 203 corresponding to the virtual buttons.

25 In this case, the virtual button screen is not limited to

the commonly used button arrangement of a game controller, that is, an arrangement that includes direction keys on the left side and control buttons on the right side. For example, the virtual button screen may be generated based on various 5 skins that are created by imitating a piano keyboard, a drum set, the steering wheel of a Formula 1 (F1) car, the control board of an airplane, etc.

Furthermore, one or more mobile terminals 20 may be enabled to display respective portions of one big virtual 10 button screen, thereby overcoming a limitation related to the limited screen size of the mobile terminal.

By doing so, a gamer is ready to control the playing of a game running on a personal computer or the like while holding the mobile terminal 200 in his or her hands.

15 While playing a game, a gamer may touch the virtual buttons visually displayed on the touch screen 201 of the mobile terminal 200, freely move the mobile terminal 200 in a 3D space to adjust the roll, the pitch, and the yaw.

When a gamer touches the virtual button regions displayed 20 on the touch screen 202, touch signals are generated and transferred to the touch event generating unit 23.

The touch event generating unit 23 generates touch event objects based on valid touch signals related to regions corresponding to the virtual buttons, which belong to input 25 touch signals.

The touch event filter 24 may generate touch input messages that can be finally recognized as key inputs by the game application 30 based on the valid touch event objects. For example, from a touch event object generated as a Δ- shaped touch region has been touched on the touch screen 202 for one second, a touch input message, equivalent to a key input that is generated when the "s" key of the keyboard has been pressed for one second, may be generated.

Furthermore, when a gamer tilts or moves the mobile terminal 200, the acceleration sensor 203 generates an acceleration signal. The generated acceleration signal is input to the acceleration data generating unit 25 and processed so as to be valid acceleration data.

The acceleration data filter 26 may generate a movement input message that can be finally recognized as a key input by the game application 30 based on the valid acceleration data.

The client message interfacing unit 27 converts the touch input message or the movement input message into a virtual input message in a form that can be acknowledged by the virtual controller server 10, and transmits the virtual input message to the personal computer 100 via the wired/wireless communication interface 201.

The virtual input message received by the wired/wireless communication interface 101 of the personal computer 100 is transferred to the key mapping unit 13 via the server message

interfacing unit 12.

The key mapping unit 13 may identify the key input value mapped to the virtual input message received from the virtual controller client 20 based on the button setting information 5 previously set by the button setting generating unit 11.

The key input value identified through the mapping may be input to the application 30 using a plurality of methods.

One of these methods uses a message transfer architecture that is provided by the operating system of the personal 10 computer 100. For example, the key input value is transferred to the application 30 using the Windows message architecture of the personal computer 100, like a keyboard input or mouse input.

Another method uses an input/output API that is provided 15 by the operating system of the personal computer 100. For example, the key input value is transferred to the application 30 via the legacy input/output processing unit 15 and the Windows direct input API 16 that process the keyboard input and output of the personal computer 100.

20 From the point of view of the application 30, the key input based on the virtual input message generated and provided by the virtual controller client 20 is indistinguishable from the key input generated by a keyboard or a mouse installed in the actual personal computer 100.

25 FIG. 2 is a conceptual diagram illustrating an example of

the screen of a mobile terminal when a virtual controller is implemented on the mobile terminal according to an embodiment of the present invention.

Referring to FIG. 2, the illustrative virtual button screen is displayed on the touch screen 202 of the mobile terminal 200. The illustrative virtual button screen includes four direction movement button regions and four function button regions.

When a gamer touches the movement button region or function button region of the touch screen 202 while holding the mobile terminal 200, a virtual input message is generated based on a touch signal. The generated virtual input message is transmitted from the mobile terminal 200 to the personal computer 100, and is then provided as a movement key or a function key input to the game application 30 that is running on the personal computer 100.

FIG. 3 is a flowchart illustrating a remote controller interfacing method using a virtual controller client implemented on a mobile terminal and a virtual controller server implemented on a personal computer according to an embodiment of the present invention.

Referring to FIG. 3, first, it is assumed that the virtual controller server 10 and the application 30 are run on the personal computer 100, the virtual controller client 20 is run on the mobile terminal 200 having the touch screen 202 and

the acceleration sensor 203, and the personal computer 100 and the mobile terminal 200 are connected to each other via the wired/wireless communication interfaces 101 and 201.

At step S31, the virtual controller server 10 generates 5 button setting information including mapping relationship between key inputs required by the application 30 and virtual input messages to be transmitted from the virtual controller client 20, and transfers a setting message including the button setting information to the virtual controller client 20 10 of the mobile terminal 200.

At step S32, the virtual controller client 20 specifies the arrangement and attributes of virtual buttons based on the button setting information extracted from the received setting message, and displays a virtual button screen on which virtual 15 button regions are visually arranged on the touch screen 202 or activates the acceleration sensor 203.

At step S33, the virtual controller client 20 generates touch event objects based on a touch signal that is generated when a gamer touches the virtual button region of the touch 20 screen 202, and generates a touch input message based on the valid touch event objects.

At step S34, the virtual controller client 20 generates acceleration data based on an acceleration signal that is generated by the acceleration sensor 203 when a gamer tilts or 25 moves the mobile terminal 200, and generates a movement input

message based on the valid acceleration data.

At step S35, the virtual controller client 20 converts the touch input message or movement input message into a virtual input message in a form that can be transmitted to the 5 virtual controller server 10, and transmits the virtual input message to the personal computer 100 via the wired/wireless communication interface 201.

At step S36, the virtual controller server 10 identifies a key input value mapped to the virtual input message received 10 from the virtual controller client 20 based on the button setting information.

At step S37, the virtual controller server 10 transfers the identified key input value to the application 30 via a Windows message architecture or a direct input API, in the 15 same way as the key input of a legacy controller, such as a keyboard or a mouse.

According to the mobile terminal-based virtual controller and the remote control system using the same of the present invention, a user can configure the virtual controller so that 20 it has an arrangement of buttons that is optimized for each game.

According to the mobile terminal-based virtual controller and the remote control system using the same of the present invention, a user can run the virtual controller on a mobile 25 terminal such as a smart phone.

According to the mobile terminal-based virtual controller and the remote control system using the same of the present invention, a user can operate a mobile terminal, such as a smart phone, as a controller for a game or a remote controller 5 for any one of various purposes.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing 10 from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:

1. A virtual controller client, the virtual controller client operating based on a mobile terminal so that the
5 virtual controller client is allowed to remotely communicate with a virtual controller server running on a computer for remote key input on an application running on the computer, the virtual controller client comprising:
 - a button setting adjusting unit configured to receive
10 button setting information including mapping relationship between key inputs to the application and virtual input messages from the virtual controller server, and to specify an arrangement and attributes of virtual buttons based on the received button setting information;
 - 15 a user virtual button interface configured to generate a virtual button screen in which touch regions corresponding to the virtual buttons are visually displayed, and to display the virtual button screen on a touch screen of the mobile terminal;
 - 20 a touch event filter configured to generate touch input messages that can be recognized as key inputs by the application, based on touch event objects that are generated from touch signals, of the touch regions corresponding to the virtual buttons, among touch signals input by the touch
25 screen; and

a client message interfacing unit configured to convert the touch input message into a virtual input message in a form that can be recognized by the virtual controller server, and to output the virtual input message.

5

2. The virtual controller client of claim 1, wherein:

the user virtual button interface activates an acceleration sensor of the mobile terminal so that movements of the mobile terminal can be detected; and

10 wherein the virtual controller client further comprises:

an acceleration data filter configured to generate a movement input message that can be recognized as a key input by the application, based on acceleration data that is generated based on an acceleration signal generated by 15 the acceleration sensor; and

the client message interfacing unit operable to convert the touch input message or the movement input message into a virtual input message in a form that can be recognized by the virtual controller server and to 20 output the virtual input message.

3. A computer-readable storage medium storing a program that is run by the virtual controller client set forth in claim 1 or 2.

25

4. A virtual controller server, the virtual controller server operating on a computer so that the virtual controller server is allowed to remotely communicate with a virtual controller client running on a remote mobile terminal
5 including a touch screen for remote key input on an application running on the computer, the virtual controller server comprising:

10 a button setting generating unit configured to generate button setting information including mapping relationship between key inputs to the application and virtual input messages;

15 a server message interfacing unit configured to transmit a setting message including the button setting information to the virtual controller client, and to receive a virtual input message from the virtual controller client, the virtual input message being generated based on a touch on the touch screen of the mobile terminal; and

20 a key mapping unit configured to identify a key input value mapped to the received virtual input message based on the button setting information.

25 5. The virtual controller server of claim 4, wherein the mobile terminal further comprises an acceleration sensor configured to detect movements, and wherein the server message interfacing unit operable to receive a virtual input message

generated based on a movement of the mobile terminal.

6. The virtual controller server of claim 4, wherein the key mapping unit transfers a key input value to the application via a message transfer architecture of an operating system that runs the application on the computer.

7. The virtual controller server of claim 4, wherein the key mapping unit transfers a key input value to the application via an input and output application programming interface (API) of an operating system that runs the application on the computer.

8. A computer-readable storage medium storing a program that is run by the virtual controller server set forth in any one of claim 5 to 7.

9. A remote control system, comprising:
a virtual controller server, being operated on a computer, for generating button setting information including mapping relationship between key inputs to an application running on the computer and virtual input messages, transfers the button setting information to a virtual controller client, for extracting a key input from a virtual input message received from the virtual controller client, and for providing

the key input to the application; and

a virtual controller client, being operated on a mobile terminal including a touch screen and being configured to remotely communicate with the computer, for specifying an 5 arrangement and attributes of virtual buttons based on the button setting information received from the virtual controller server, for generating a virtual button screen in which touch regions corresponding to the virtual buttons are visually displayed on the touch screen of the mobile terminal, 10 for generating a touch input message that can be recognized as a key input by the application, based on touch event objects generated based on touch signals for the touch regions corresponding to the virtual buttons, and for converting the touch input message into a virtual input message in a form 15 that can be recognized by the virtual controller server and output the virtual input message.

10. The remote control system of claim 9, wherein:

the mobile terminal further comprises an acceleration 20 sensor configured to detect movements; and

the virtual controller client operates such that it activates an acceleration sensor of the mobile terminal so that movements can be detected, generates a movement input message that can be recognized as a key input by the 25 application, based on acceleration data that is generated

based on an acceleration signal generated by the acceleration sensor, and converts the touch input message or movement input message into a virtual input message in a form that can be received by the virtual controller server and then outputs the
5 virtual input message.

11. A remote controller interfacing method, the remote controller interfacing method using a virtual controller server running on a computer and a virtual controller client
10 running based on a remote mobile terminal including a touch screen for remote key input on an application running on the computer, the remote controller interfacing method comprising:

generating, by the virtual controller server, button setting information including mapping relationship between key
15 inputs required by the application and virtual input messages to be transmitted by the virtual controller client, to be transferred to the virtual controller client;

specifying, by the virtual controller client, an arrangement and attributes of virtual buttons based on the
20 button setting information, and displaying, by the virtual controller client, a virtual button screen in which the virtual button regions are visually arranged on the touch screen;

generating, by the virtual controller client, touch event
25 objects based on a touch signal generated by the touch screen,

and further a touch input message based on the valid touch event objects;

transferring, by the virtual controller client, a virtual input message generated based on the touch input message to
5 the virtual controller server;

identifying, by the virtual controller server, a key input value mapped to the received virtual input message based on the button setting information; and

transferring, by the virtual controller server, the
10 identified key input value to the application.

12. The remote controller interfacing method of claim 11,
wherein:

the mobile terminal further comprises an acceleration
15 sensor configured to detect movements; and

the remote controller interfacing method further
comprises:

generating, by the virtual controller client, a movement input message that can be recognized as a key input by the
20 application, based on acceleration data that is generated based on an acceleration signal generated by the acceleration sensor; and

converting, by the virtual controller client, the movement input message into a virtual input message in a form
25 that can be received by the virtual controller server, and

outputting, by the client, the virtual input message.

13. The remote controller interfacing method of claim 11,
wherein the key input value identified by the virtual
5 controller server is transferred to the application via a
message transfer architecture of an operating system that runs
the application on the computer.

14. The remote controller interfacing method of claim 11,
10 wherein the key input value identified by the virtual
controller server is transferred to the application via an
input and output API of an operating system that runs the
application on the computer.

15 15. A computer-readable storage medium storing a program
that can implement the remote controller interfacing method
set forth in any one of claims 11 to 14.

ABSTRACT

Disclosed herein are a virtual controller client mobile terminal-based virtual game controller and a remote control system using the same. The remote control system includes a virtual controller server and a virtual controller client. The virtual controller server generates button setting information including mapping relationship between key inputs and virtual input messages, transfers the button setting information, extracts a key input from a virtual input message, and provides the key input to the application. The virtual controller client specifies an arrangement and attributes of virtual buttons based on the button setting information, generates a virtual button screen on the touch screen of the mobile terminal, generates a touch input message based on touch event objects generated based on touch signals for regions corresponding to the virtual buttons, and converts the touch input message into a virtual input message and outputs the virtual input message.

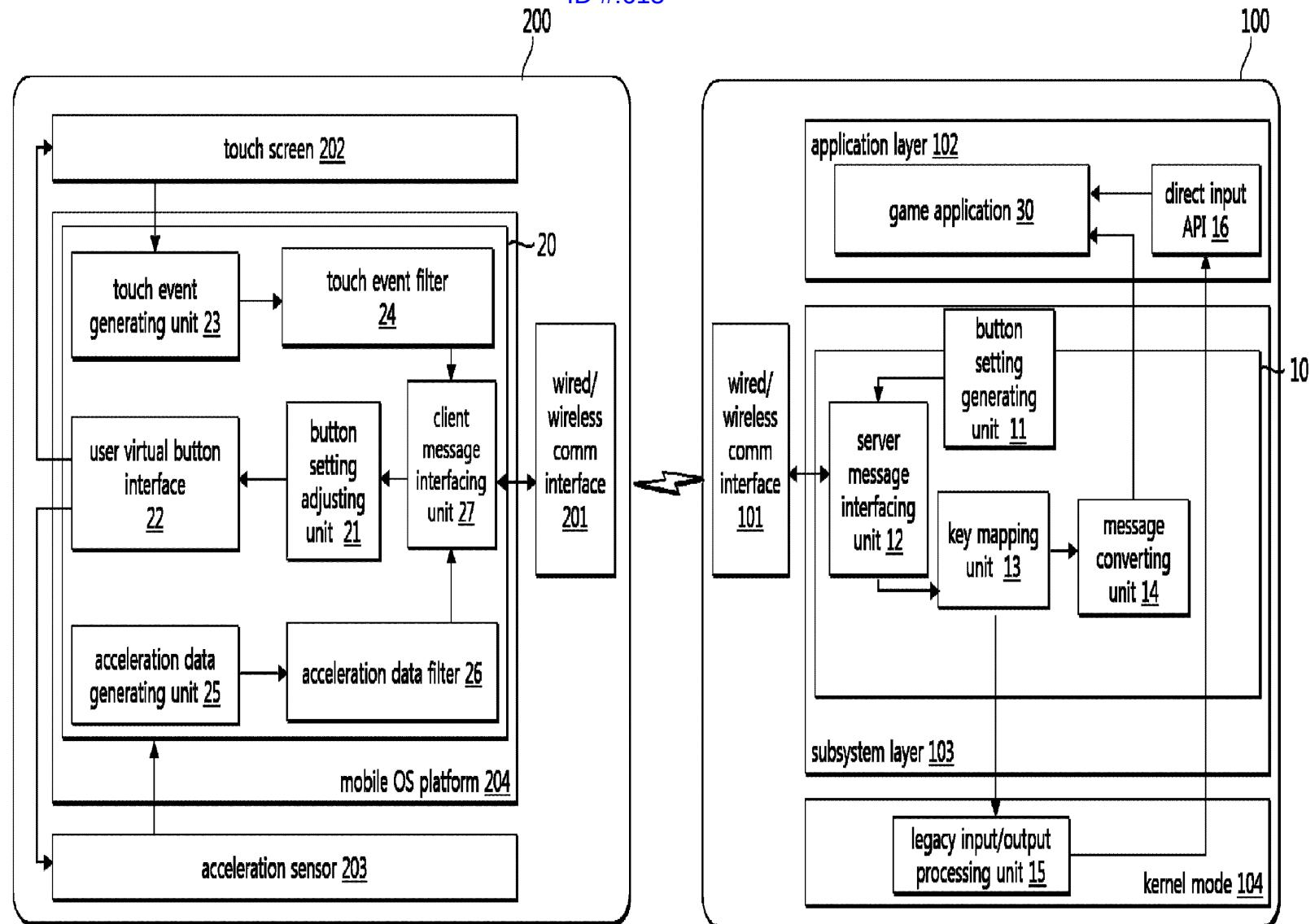


FIG. 1

FIG. 2

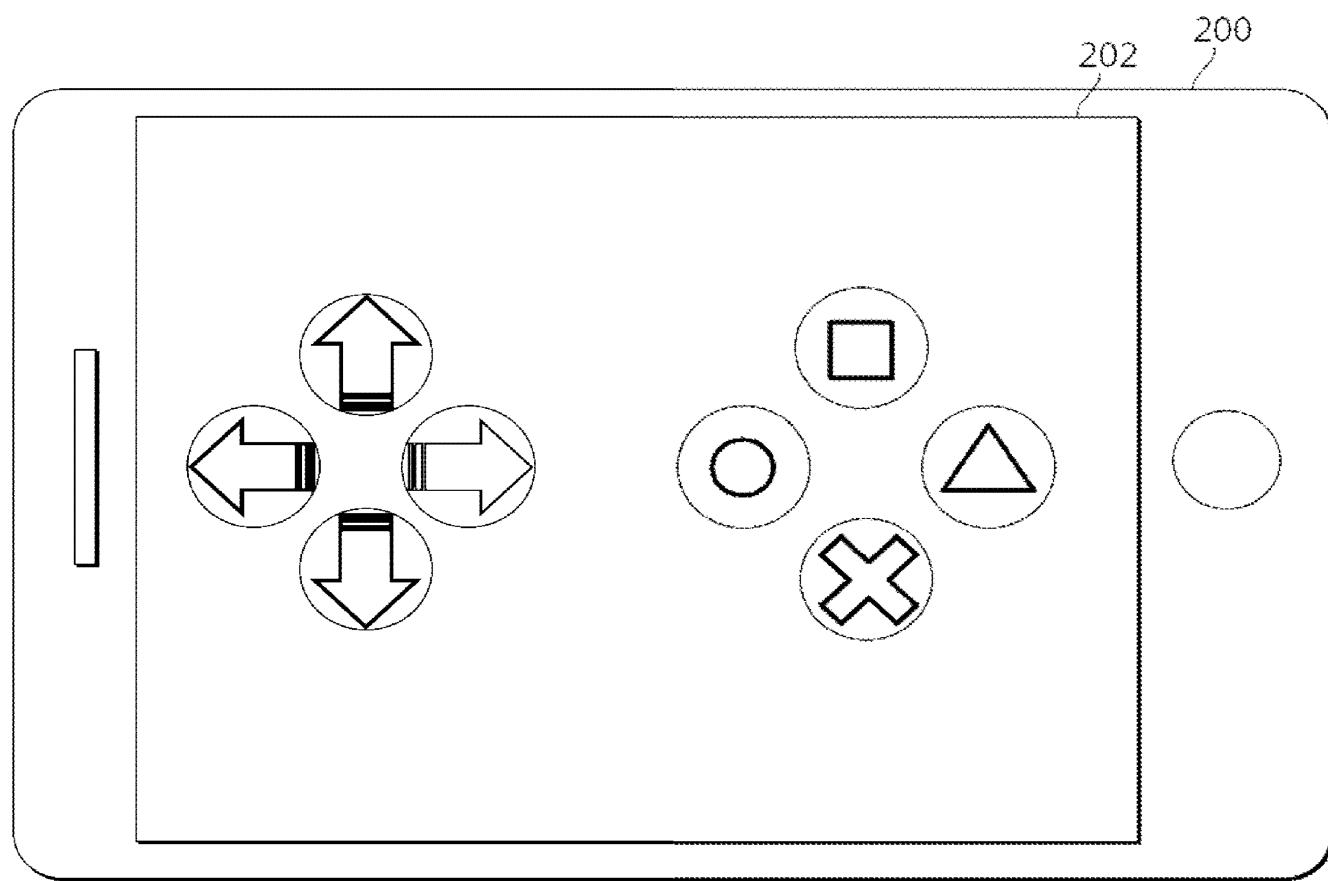


FIG. 3.

